



# February: 9-12

## Food Plants and Ecosystems

### WINTER SQUASH



# South Carolina Farm to School Lessons

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## Overview

Welcome to the South Carolina Farm to School February Nutrition Education Lesson. This lesson contains information & hands on activities where 9-12 students will be learning about plants and how components in nature interact with each other in ecosystems. Our goal for this lesson is to help children explore the connection between food production and ecosystems interactions.

In order to achieve this goal, the students will study what an ecosystem is and review plants roles within an ecosystem. We will utilize the school garden to do an ecosystem hunt and then develop a walking tour of the school garden.

**These lessons are designed to be delivered over a four week period, noting that introduction & activities will be supplemental to existing curriculum.**

**Estimated Total time: 105-170 minutes**

## Teacher Background

Most plants and animals live in areas with very specific climate conditions, such as temperature and rainfall patterns, that enable them to thrive. Any change in the climate of an area can affect the plants and animals living there, as well as the makeup of the entire ecosystem. Some species are already responding to a warmer climate by moving to cooler locations. For example, some North American animals and plants are moving farther north or to higher elevations to find suitable places to live. Climate change also alters the life cycles of plants and animals. For example, as temperatures get warmer, many plants are starting to grow and bloom earlier in the spring and survive longer into the fall. Some animals are waking from hibernation sooner or migrating at different times, too.

Plants and animals have adapted to changes in the environment for millions of years. However, today's changes are happening faster and on a larger scale than in the past, which makes it difficult for plants and animals to adapt. Changes in climate can affect the types of plants that can grow in an area. Animals' food supplies, water, life cycles, breeding habits, and ranges will be affected, too.

Some animals will adapt to changing conditions or move elsewhere, but others could have trouble surviving. Some unwelcome invaders (invasive species) could benefit from climate change by expanding their range or being able to survive through the winter in new places.

All these changes will affect the way ecosystems function, and changes to ecosystems affect people, too. That's because we rely on ecosystems to provide us with many services, like clean water, food, and medicines.<sup>1</sup>

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It is easy to forget that food is a product of ecosystems. We usually purchase it in supermarkets and restaurants, where it bears little resemblance to the original plant or animal. Yet, without sunlight, soil, water, plants, and animals interacting in an ecosystem, we would have no food.

Food gives us the energy we need to stay alive, grow, and reproduce, and we can get this energy only from other organisms. Although the sun emits enormous quantities of radiant energy every day, our bodies cannot use it directly. Instead, we rely on plants to convert it to chemical energy (food) through photosynthesis. This energy

may then pass through a food chain to us. Photosynthesis, pollination, predation, decomposition, the cycling of nutrients, and water are all involved in creating our food.

Although farms and gardens depend on ecosystem processes, they are different from natural ecosystems. Natural ecosystems contain plant and animal populations interacting in balance with one another and nonliving things, and can sustain themselves over time. In farms and gardens, people plant seeds, add water, amend the soil, weed, and remove pests to increase production, all of which can affect both balance and sustainability.

As seen in Nourish, these human impacts are often far-reaching, especially with industrial agriculture. For example, pesticides and fertilizers applied to industrial farms in the Midwest have created a dead zone—where almost nothing can live—thousands of miles away in the Gulf of Mexico.<sup>2</sup>

For more information on school gardens, view this great video about Edible Education from Nourish Life: <http://www.nourishlife.org/2011/03/edible-education/>

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<sup>1</sup> Adapted from: A Student's Guide to Global Climate Change (<http://www.epa.gov/climatechange/kids/impacts/effects/ecosystems.html>)

<sup>2</sup> Adapted from: Nourish Life ([http://www.nourishlife.org/pdf/Nourish\\_Curriculum\\_Guide.pdf](http://www.nourishlife.org/pdf/Nourish_Curriculum_Guide.pdf))

# Lesson checklist



**F2S Aim:** Explore the connection between food and ecosystems interactions.

**F2S Objectives**

*Students will be able to:*

- \* Explain the term "ecosystem".
- \* Discuss the role that plants play in nature (food chains, food webs, ecosystems).
- \* Demonstrate understanding of the components and interactions of an ecosystem (i.e. process of food production).
- \* Observe components and interactions of a local ecosystem (i.e. school garden).
- \* Taste the Palmetto Pick of the Month (winter squash).



**Materials:**

- \* Ecosystem Hunt (Appendix A)
- \* Farm to School Planting Sheet (Appendix B)
- \* Plant Guide (Appendix C)
- \* Winter Squash Power Point (Appendix D and in dropbox)
- \* Family Activity Letter (Appendix E and in dropbox)
- \* Grocery list: 1 spaghetti squash, olive oil, parmesan cheese
- \* Kitchen Supplies: cutting board, knife, oven mitts, fork, paper plates & forks to serve/eat squash
- \* Gardening journal
- \* Family Activity Sheet (Appendix E & in Dropbox)
- \* Copies of the February Farm to School Lesson Assessment (in Dropbox)



**National Health Education Standards**

1.12.3	2.12.2	2.12.6	5.12.1	5.12.4
5.12.5	5.12.6	5.12.7	7.12.1	7.12.2
7.12.3	8.12.3			



## SC State Standards

E2-2.2	Compare/contrast information within and across texts to draw conclusions and make inferences.
E2-2.4	Create responses to informational texts through a variety of methods (for example, drawings, written works, oral and auditory presentations, discussions, and media productions).
E2-2.7	Analyze propaganda techniques in informational texts.
E2-4.1	Organize written works using prewriting techniques, discussions, graphic organizers, models, and outlines.
E2-4.2	Use complete sentences in a variety of types (including simple, compound, complex, and compound-complex).
E2-4.4	Use grammatical conventions of written Standard American English, including <ul style="list-style-type: none"> <li>• subject-verb agreement,</li> <li>• pronoun-antecedent agreement,</li> <li>• agreement of nouns and their modifiers,</li> <li>• verb formation,</li> <li>• pronoun case,</li> <li>• formation of comparative and superlative adjectives and adverbs, and</li> <li>• idiomatic usage.</li> </ul>
E2-4.5	Revise writing to improve clarity, tone, voice, content, and the development of ideas.
E2-4.6	Edit written pieces for the correct use of Standard American English, including the reinforcement of conventions previously taught.
E2-5.5	Create technical pieces (for example, proposals, instructions, and process documentation) that use clear and precise language suitable for the purpose and <b>audience</b> .
E2-6.2	Use direct quotations, paraphrasing, or summaries to incorporate into written, oral, auditory, or visual works the information gathered from a variety of research sources.
E2-6.3	Use a standardized system of documentation (including a list of sources with full publication information and the use of in-text citations) to properly credit the work of others.
E2-6.4	Use vocabulary (including Standard American English) that is appropriate for the particular audience or purpose.
E2-6.5	Create written works, oral and auditory presentations, and visual presentations that are designed for a specific audience and purpose.
E2-6.6	Select appropriate graphics, in print or electronic form, to support written works, oral presentations, and visual presentations.

## Lesson Essential Components

Lessons profile	Page(s)	Yes	No	Notes
Palmetto Pick of the Month	11	★		Tasting activities with spaghetti squash
Health Education Standards	8-11	★		
SC-Cross Curricular Standards	8-11	★		
SC-F2S Behavioral Goals	8-11	★		
Cooking Activities	11	★		
Tasting Activities	8-11	★		
Physical Activity	8-11	★		
Food Safety	11	★		
School Food Garden	10-11	★		
Student to Farmer Connections (i.e. field trips, talks)			★	
Student to Chef Connections			★	
Farm to Cafeteria			★	
Provision of scientific knowledge/rationale	8-11	★		
Risk and benefits about healthy behaviors			★	
Obstacles, Barriers & Solution	8-11	★		
Family involvement and other supports		★		Family Activity Letter
Set goals and monitoring progress			★	
Other hands on activities:	8-11	★		Team Activities, Tour

## Let's Learn!

### What is an Ecosystem?<sup>1</sup>

**Estimated Time: 30-45 minutes**

1. Ask students what they think the term “ecosystem” means. If students have not mentioned it, point out that “ecosystem” contains the root “system.” Ask students what a system is and have them give examples. (They might name mechanical systems like a car, biological systems like the respiratory system, or social systems like a school.) Using the examples, help students understand that a system is a collection of parts or components that interact with one another to function as a whole.
  2. Ask students to name the components that might make up an ecosystem and the kinds of interactions that might occur in an ecosystem, listing their ideas on the board. Explore the concept that these components— sunlight, rain, plants, animals, for example—interact to make our food. Would it be possible for us to have food without at least some of these ecosystem parts and interactions? If so, how? If not, which are most vital to us?
  3. \*While ecosystems consist of many parts, in the Let's Learn section, we will concentrate on plants. The activity will tie in all components of the ecosystem.
- Review with students the plant parts learned in the November lesson: roots, stems, leaves, flowers, fruits, and seeds. Briefly discuss the importance of each:

#### Roots

The roots help provide support by anchoring the plant and absorbs and carries the water and nutrients needed for plants to grow.

#### Stems

Stems carry water and nutrients taken up by the roots to the leaves. Stems also provide support for the plant allowing the leaves to reach sunlight that they need to produce food.

(Extra Learning)

\*Where the leaves join the stem is called the node.

\*The space between the leaves and the stem is called the internode.

#### Leaves

Leaves are the food making factories of green plants. Leaves come in many different shapes and sizes. Leaves can be simple, which means one leaf attached to a stem. (Example: Oak or Maple Leaf)

Leaves can also be complex, which means there are many leaves attached to the stem. (Example: Ash or Locust) Leaves are made to catch light and have openings to allow water and air to come and go. A leaf has an waxy coating on the outside, called the **cuticle**, that protects the leaf.

Leaves are the site of the food making process called **photosynthesis**.

Photosynthesis supplies food for the plant and oxygen for other forms of life.

*NOTE:* Green plants help make the oxygen that you breathe every day.



Flowers	Flowers not only look pretty but, are important in making seeds. Flowers have some basic parts. The female part is the <b>pistil</b> . It is usually located in the center of the flower. The male part is called the <b>stamens</b> and usually surrounds the pistil. Petals are also important parts of the flower because they help attract pollinators such as bees, butterflies and bats. You will also see fine green leaf-like parts at the bottom of the flower called a <b>sepal</b> . They protect the developing bud.
Fruits	The fruit is the ripened part containing the seeds. Many fruits help seeds spread (maple seeds). Other things we call vegetables are really fruits such as tomatoes, cucumbers and beans.
Seeds	Every seed is a tiny plant with leaves, stems, and root parts waiting for the right things to happen to make it germinate. Seed are protected by a coat. Seeds are a plant's way of getting from one area to another by either wind, water or animals.

4. Next, review with the students the requirements plants need to grow: Room to Grow, Temperature, Light, Water, Air, Nutrients, and Time.

Room to Grow	Plants need space to leaves can expand and carry out the job of making food. Roots also need room to grow. Plants growing in small spaces will have their roots crowded and that will result in smaller plants or no growth.
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Temperature	Most plants like temperatures that humans like. Some plants like warmer temperatures while others prefer cooler temperatures for best growth.
Light	Plants need light to grow. It is best for plants to get 14-16 hours of light daily. Plants grown indoors like bright light. Try placing plants close to windows to take advantage of light. A plants stem will be thin and unhealthy if it is not getting enough light.
Water	3. Water is important in the plant's ability to make and move nutrients/ Without water or with too much water, a plant will die/ For this reason, watering is an important part of plant care. Most plants like to be watered when the soil is slightly dry to the touch. When watering, moisten the soil by using enough water so that it starts to come out of the hole in the bottom of a container (Make sure your container has a drainage hole in the bottom of the container). How often depends of the size of the plant, time of year, and type of plant. The best guide is that if you stick your finger in the soil, one inch, and it's dry, it needs to be watered.
Air	Plants use carbon dioxide in the air and return oxygen. Smoke, gases and other pollutants can damage plants.

<b>Nutrients</b>	Most of the nutrients that a plant needs are dissolved in water and then taken up by the plant through its roots. Fertilizers will help to keep the soil supplied with nutrients a plant needs.
<b>Time</b>	It takes time to grow and care for plants. Some plants require more time than others. Getting plants to flower or fruit at a certain time can be challenging. Plants that normally grow outdoors need a certain number of days to flower or fruit. You can time plants to flower or fruit on a certain date. This is a good lesson in both plant science and math.

## Activity

### Finding an Ecosystem?

**Estimated Time: 45-75 minutes**

1. Students will visit the school garden to complete this activity. Explain to students that they will be looking in the garden for evidence of ecosystem components and interactions. Give students copies of the **Ecosystem Hunt** worksheet (Appendix A) student page. Review the terms and have students provide some possible examples for each. Also review expected behavior for working outside.

2. Take the class to the garden and have students work in pairs to conduct the hunt. As they are working, circulate among them to check in on their findings and to answer any questions.

3. Bring the group together, and ask pairs to share some of the evidence they have collected. Discuss what they learned from the hunt:

- What evidence did you find for the various ecosystem components and interactions?
- In what ways do garden plants—and people—depend on each of these elements?
- Considering the evidence, how healthy would you say this garden ecosystem is?

- How is the garden ecosystem different from a natural ecosystem?
- How do growing food and raising livestock affect the surrounding ecosystem?
- If we were to conduct the same hunt on an industrial farm, what differences might we observe?

4. Explain to students that they will use their evidence from the hunt to create an illustrated, self-guided tour of the garden for faculty, staff, students, and visitors, emphasizing its similarities to a natural ecosystem. The tour may consist of cards on a ring or a booklet, with each card or page focusing on one of the ecosystem components. You may choose to have students work in groups or individually.

5. Make clear that for each component, students should include the name of the component or interaction, add a brief description of what it is and where it can be found in the garden, and illustrate it with a garden example. The first card or page should also provide a brief overview of the garden as an ecosystem. Have reference materials on hand so that students can refer to them as they create their tours.

6. After they have completed their tours, give students an opportunity to share them with other students in the school.

## ★ Gardening Activity

### Preparing the Spring Garden

**Estimated Time: 15-30 mins**

#### Materials Needed:

**Farm to School Planting Sheet** (Appendix B)

**Plant Guide** (Appendix C)

*Note:* This activity is designed to help the school prepare for Spring planting in their Farm to School raised beds/in-ground gardens. Because schools are implementing lessons at different levels, please consult with the Farm to School Team at your school about the direction the school would like to take for planting the garden before doing this activity.

1. Review with the class the purpose of the school garden.
2. Explain the purpose of this activity is to design how the school garden will be planted. Take a few minutes to watch the following video:  
<http://www.youtube.com/watch?v=a-WMWISI12s>  
It will discuss considerations when designing your garden such as water and sun access.
3. Next, review the produce that grows successfully in SC in the Spring. See Appendix C for more information. Decide which plants you would like to grow. Remember to look at the plants that will be most successful in your region of the state. For additional information about growing in SC regions, please visit <http://www.clemson.edu/extension/hgic/plants/vegetables/gardening/hgic1256.html>.
4. Use the **Farm to School Planting Sheet** (Appendix B) to design where your seeds/plants will be planted in your raised beds. Think about height of plants, width of plants, varieties of plants, etc.

Don't forget to visit your raised beds with your students and take pictures of the raised beds prior to planting. Have your students envision how the garden will look. Have them record in their garden journal predictions on how quickly the plants will grow. Monitor this and write about it throughout the Spring till harvest.

You can also divide the class into groups and each group will monitor and journal about different aspects of the school garden. Groups can journal about how each of these affect the garden: weather, sun, water/rain, etc.

### ★ Palmetto Pick Activity

#### Noodle Mania!

**Estimated Time: 15-20 mins**

1. Have students wash their hands (with soap & warm water for 20 seconds) & reinforce that it is important. Show the students that you have washed the spaghetti squash before beginning.

2. Display the **Winter Squash** power point (Appendix D and also in dropbox) while you are preparing the spaghetti squash.
3. Cut spaghetti squash in half. Scrape out the seeds or select two-three students to help scrape out the seeds.
4. Steam the squash in the microwave, rind side up, for six to eight minutes. \*Be careful removing the squash, it will be hot. Wear oven mitts.
5. Separate strands with a fork. When finished, toss with olive oil and parmesan cheese.
6. Serve a 1 oz. portion for each student to taste.

#### Ingredients:

1 spaghetti squash

Olive Oil (to taste)

Parmesan Cheese (to taste)

Encourage students to discuss the “noodles” of the spaghetti squash. Record on the board some of their perceptions of the spaghetti squash:

- Did it taste like they thought it would taste?
- Does it taste like noodles?
- Is it fun to eat like spaghetti?

*Note:* One spaghetti squash should yield roughly 40 oz. of “spaghetti”. If you are serving more than 30 students, add additional spaghetti squash. The squash will be very hot, please use caution and wear oven mitts. Spaghetti squash are hard, you may want assistance in cutting the squash and/or you may want to have it cut before you begin the PPM Activity.

### Evaluation

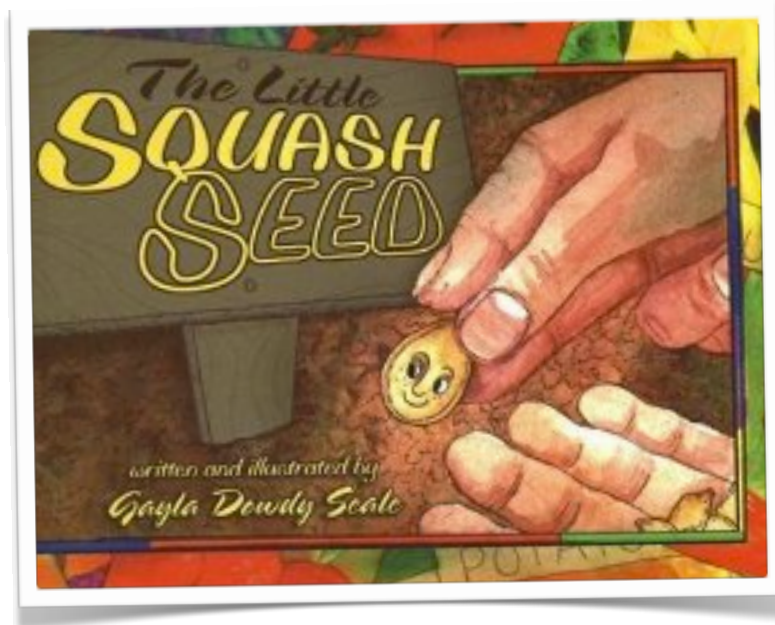
#### Formal Assessment:

1. Review **Ecosystem Hunt** & discuss the importance of plants in an ecosystem.

**Informal Assessment:** Observe participation in lesson activities. Complete survey at end of month (survey will be sent electronically).

<sup>1</sup> Adapted from Nourishlife *Food and Ecosystems* ([http://www.nourishlife.org/pdf/Nourish\\_Curriculum\\_Guide.pdf](http://www.nourishlife.org/pdf/Nourish_Curriculum_Guide.pdf))

# Resources



## Websites:

Clemson Extension Planting Information: <http://www.clemson.edu/extension/hgic/plants/vegetables/gardening/hgic1256.html>.

SC Department of Agriculture Information on School Gardens: <http://agriculture.sc.gov/schoolgardens>

## ACTIVITY FOUR ECOSYSTEM HUNT

Look for two examples or pieces of evidence for each of the ecosystem components below.  
Describe what you observed and where you observed it.

LIVING COMPONENTS	EXAMPLE 1	EXAMPLE 2
<b>Producers</b> Organisms that get energy by changing light into chemical energy, producing food		
<b>Primary Consumers (Herbivores)</b> Organisms that get energy and nutrients by eating parts of plants		
<b>Secondary Consumers (Carnivores)</b> Organisms that get energy and nutrients by eating parts of animals		
<b>Decomposers</b> Organisms that get energy by breaking down dead organic material, which is then recycled into the soil as nutrients		
<b>NON-LIVING COMPONENTS</b>		
<b>Energy</b> Sources of energy for living organisms		
<b>Soil</b> Substrate or source of nutrients for living organisms		
<b>Organic Matter</b> Dead plant or animal material that is now leaf litter or soil particles		

PROCESSES		EXAMPLE 1	EXAMPLE 2
<b>Photosynthesis</b>	Chlorophyll in green plants turning light energy into chemical energy to make food		
<b>Cycle of Nutrients</b>	Nutrients passing from one organism to another through eating, decomposition, or through plant roots		
<b>Decomposition</b>	Rotting or decaying once-living things, which release nutrients into the soil		
<b>Web of Life</b>	Energy and nutrients passing from one organism to another through the food chain or predator-prey relationships		
<b>Pollination</b>	Transferring of pollen from one plant flower to another by organisms (bees, birds, etc.) or wind		



[illegible][illegible][illegible]

## Appendix C

### What to Plant

Seeds can be started indoors between January and February and will need to be transplanted to your garden at a later time. Some vegetables, however, can be planted straight from the seed such as beans, beets, cantaloupe, carrots, corn, cucumbers, lettuce, okra, peas, pumpkins, and spinach. If you choose to grow vegetables that you will be able to harvest in a short amount of time, lettuce can be grown in 25 days and radishes can be grown in 45 days. Beets, broccoli, beans, or spinach will mature in 50 days. Additional vegetables and their corresponding planting ranges are listed in the following tables:

#### Warm Season Vegetables – Plant these in the spring to harvest before school is out for summer

Plant varieties	When to plant	Days to maturity from seed
Cantaloupe	Late March – Early May	30-35
Cucumbers	Late March – Early May	50-70
Eggplant	April – May	65-80
Southern Peas	April – May	65-125
Okra	April – Mid-May	60-70
Peppers	April – May	70-85
Sweet Corn	March – April	80-95
Squash	April – Mid-May	55
Tomatoes	April – May	55-105
Beans	Late March – April	55

#### Cool Season Vegetables – Plant these vegetables in the fall to harvest before winter break

Plant varieties	When to plant	Days to maturity from seed
Cabbage	Early August	60-80
Carrots	Early August	65-75
Collards	August	70
Lettuce	Late August	55-75
Radishes	September - November	21-28
Spinach	Late Sept – Early Nov	37-45
Beets	Early August	50-70
Broccoli	August - Early September	65-70
Cauliflower	Early August	60-70
Turnips	September – Early October	50-60

For more information, visit <http://agriculture.sc.gov/schoolgardens>.

Appendix D  
 Winter Squash Power Point  
 (will be sent electronically at Dropbox)

<p><b>PALMETTO PICK OF THE MONTH</b></p>  <p><b>WINTER SQUASH (JANUARY)</b></p> <p><small>Adapted from www.palmettothefair.com</small></p>	<p><b>Reason to Eat Winter Squash</b></p> <ul style="list-style-type: none"> <li>• Excellent source of Vitamin A</li> <li>• Excellent source of Vitamin C</li> <li>• Good source of fiber</li> <li>• Healthy vision</li> <li>• Healthy immune system</li> <li>• Strong bones &amp; teeth</li> </ul>	<p><b>Winter Squash Varieties</b></p> <p>Acorn</p> <p>Butternut</p> <p>Buttercup or Tiran</p> <p>Hubbard</p> <p>Spaghetti</p>
1	2	3
<p><b>ACORN SQUASH</b></p> 	<p><b>BUTTERNUT SQUASH</b></p> 	<p><b>BUTTERCUP SQUASH</b></p> 
4	5	6
<p><b>HUBBARD SQUASH</b></p> 	<p><b>SPAGHETTI SQUASH</b></p> 	<p><b>FAMILY ACTIVITY...</b></p> <p>Go to the grocery store with your parents and identify all of the different varieties of winter squash. Do a price cost comparison. What are the most and least expensive varieties?</p>
7	8	9